

River N Transport in CLM-RTM

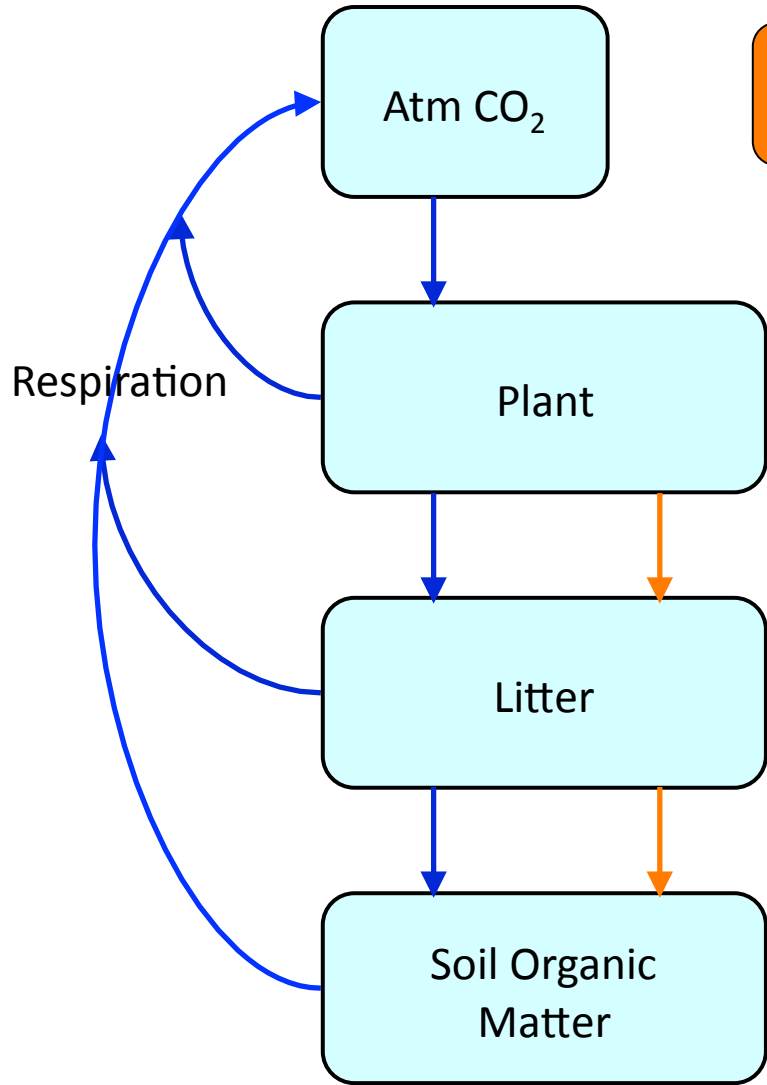
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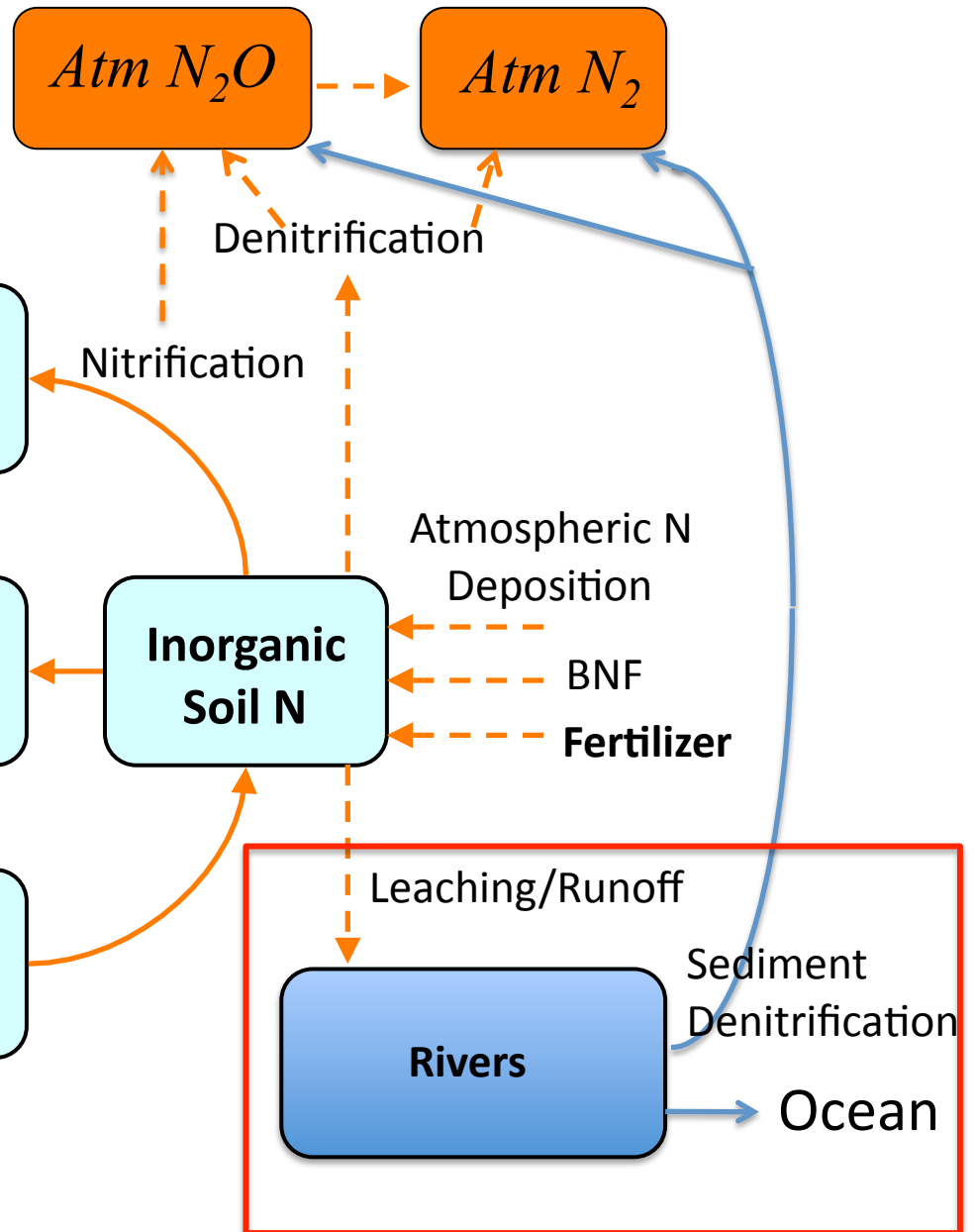


Acknowledgements: NSF ETBC, P. Hess, S. Riddick, E. Kluzek, D. Lawrence, et al.

Carbon cycle



Nitrogen cycle



Adapted from Thornton et al., 2009

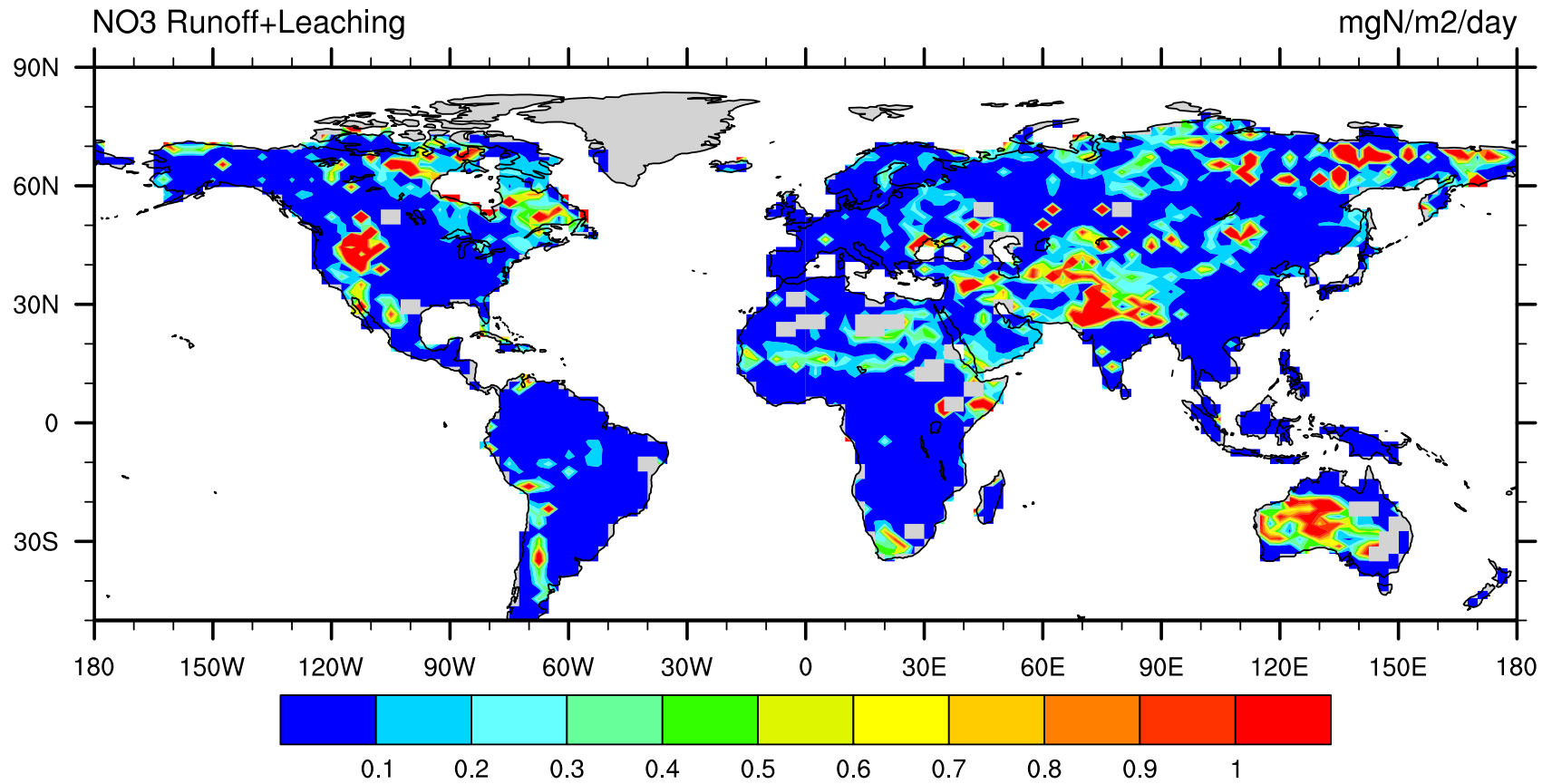
Inorganic Soil N Budget

Values in Tg N/yr

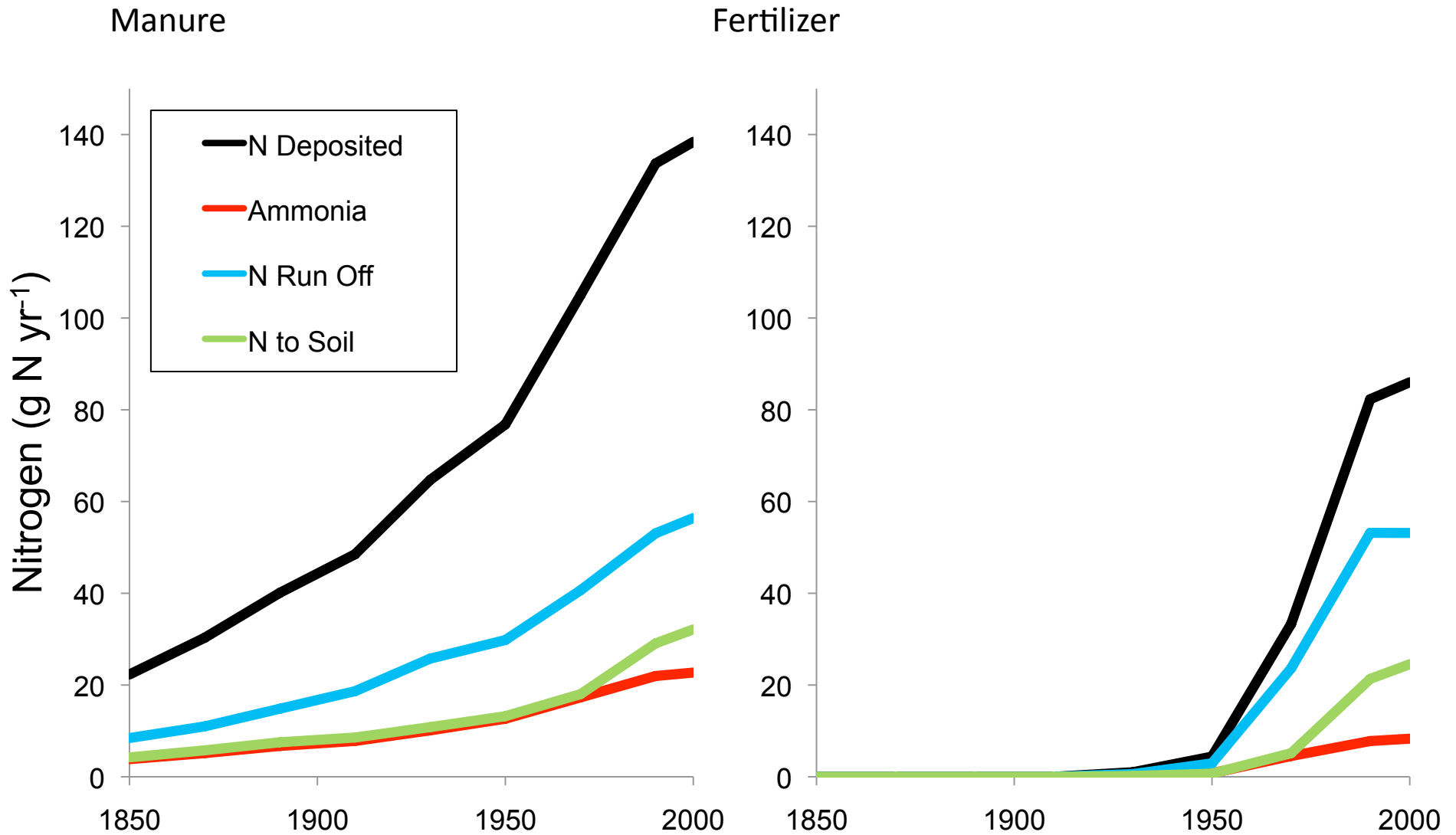
INPUTS	CLM-CN 4.0 2000	CLM-CN 4.5 1850
Biological N ₂ Fixation	120	91
Atmospheric Deposition	65	19
OUTPUTS		
Soil Denitrification	137 (74%)	38 (35%)
Leaching & Runoff	0 (0%)	7 (6%)
Fire (pyrodenitrification)	28 (15%)	46 (42%)
Storage in SOM, Vegetation	19 (10%)	19 (17%)

clm4_0_79

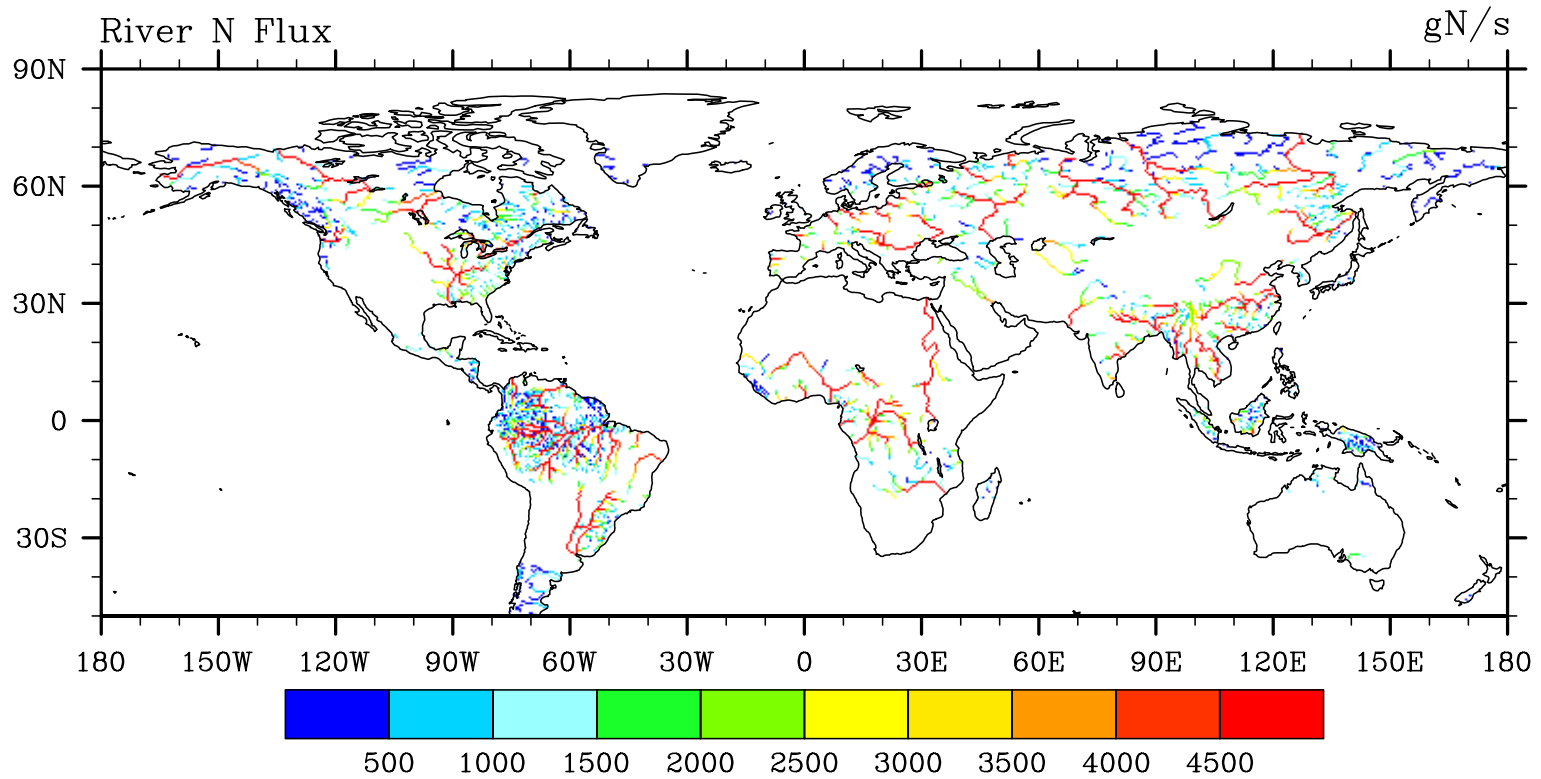
NO₃ Runoff Loss in CLM4.5



Hind-casting nitrogen pathways 1850 – present (from Stuart Riddick)

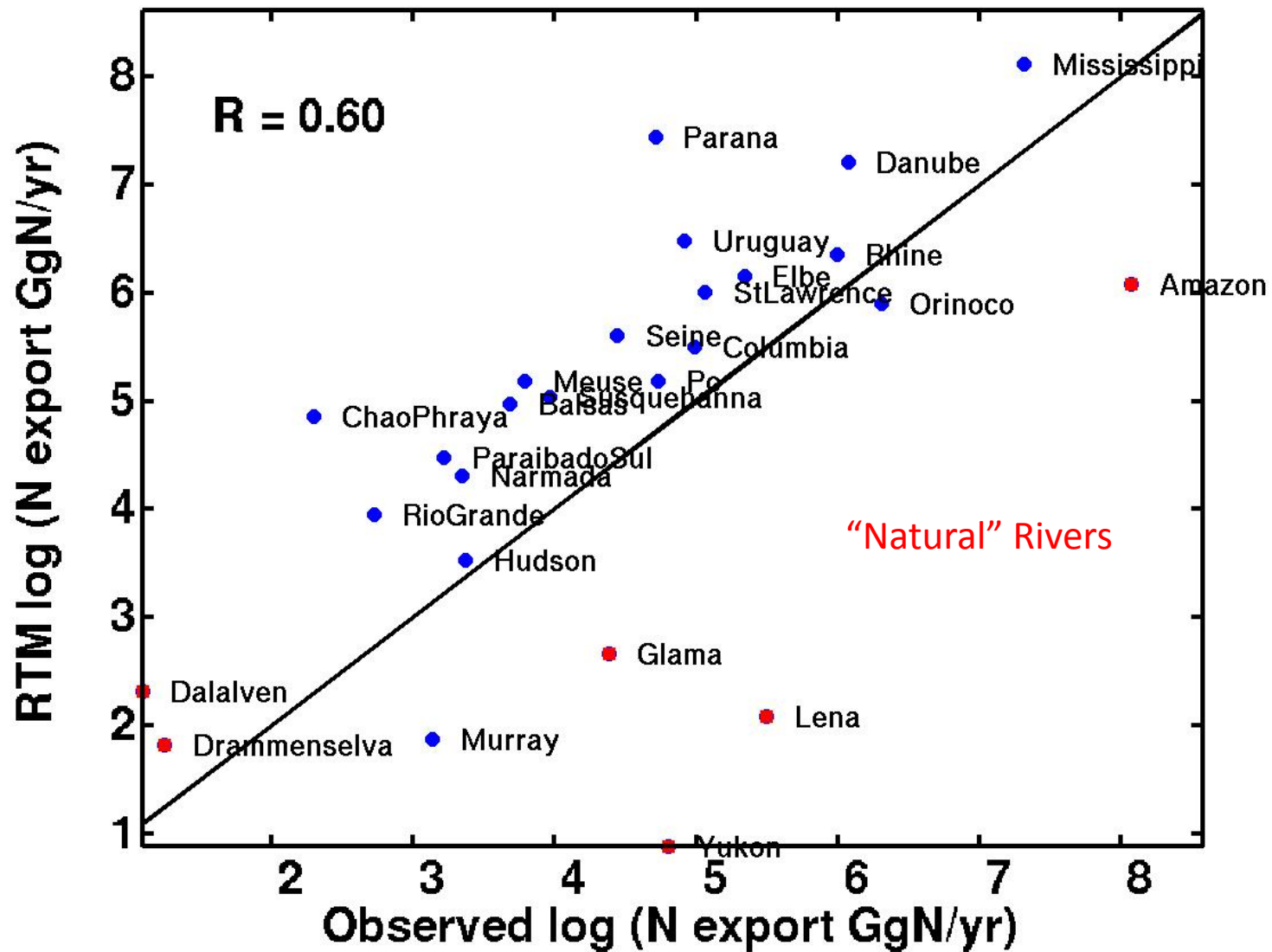


N River Transport in Coupled RTM/CLM



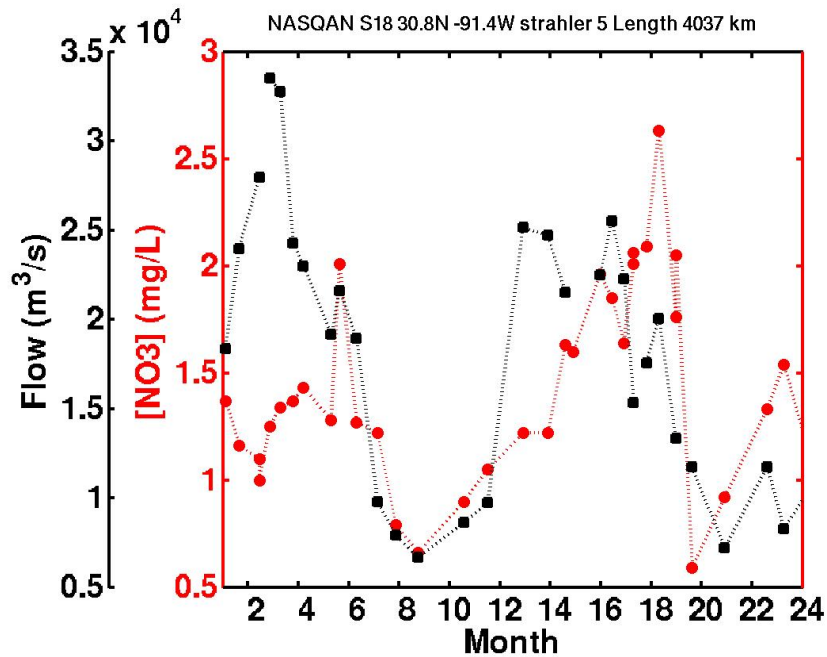
River N Export to the Ocean

Modeled v. Observed Export

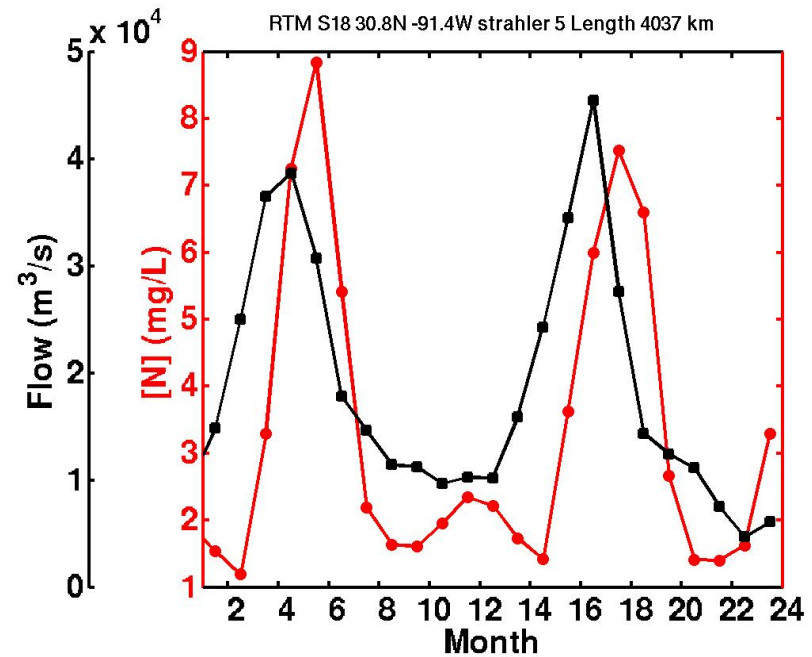


Seasonality at mouth of Mississippi River in [N] vs. volume discharge

Observed (USGS NASQAN)



Model

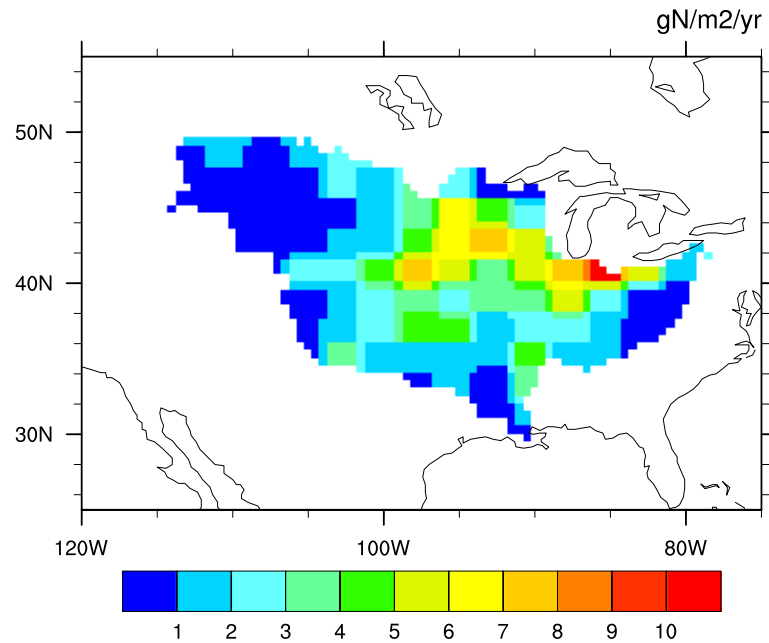


[N] Seasonality improved from CLM4.0

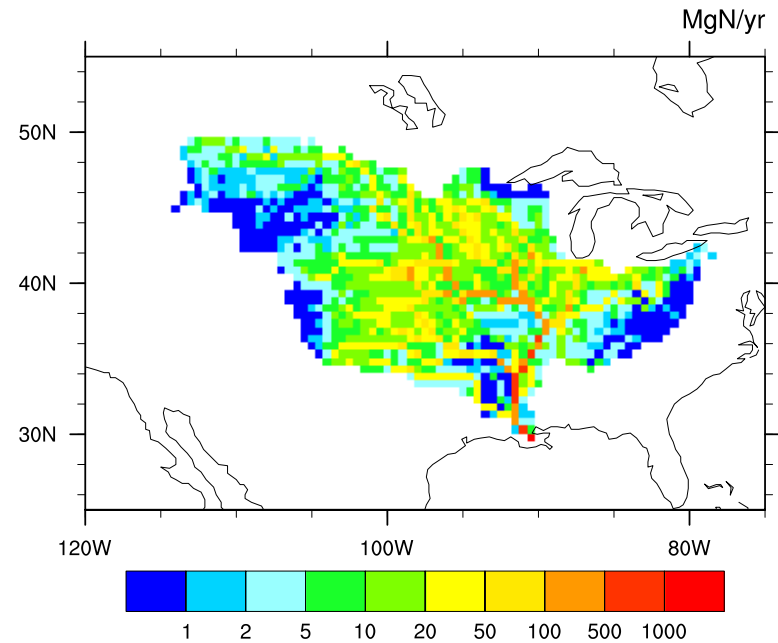
Aquatic N₂O Emissions in Mississippi River Basin

(Assuming Beaulieu et al. yield of 0.75%)

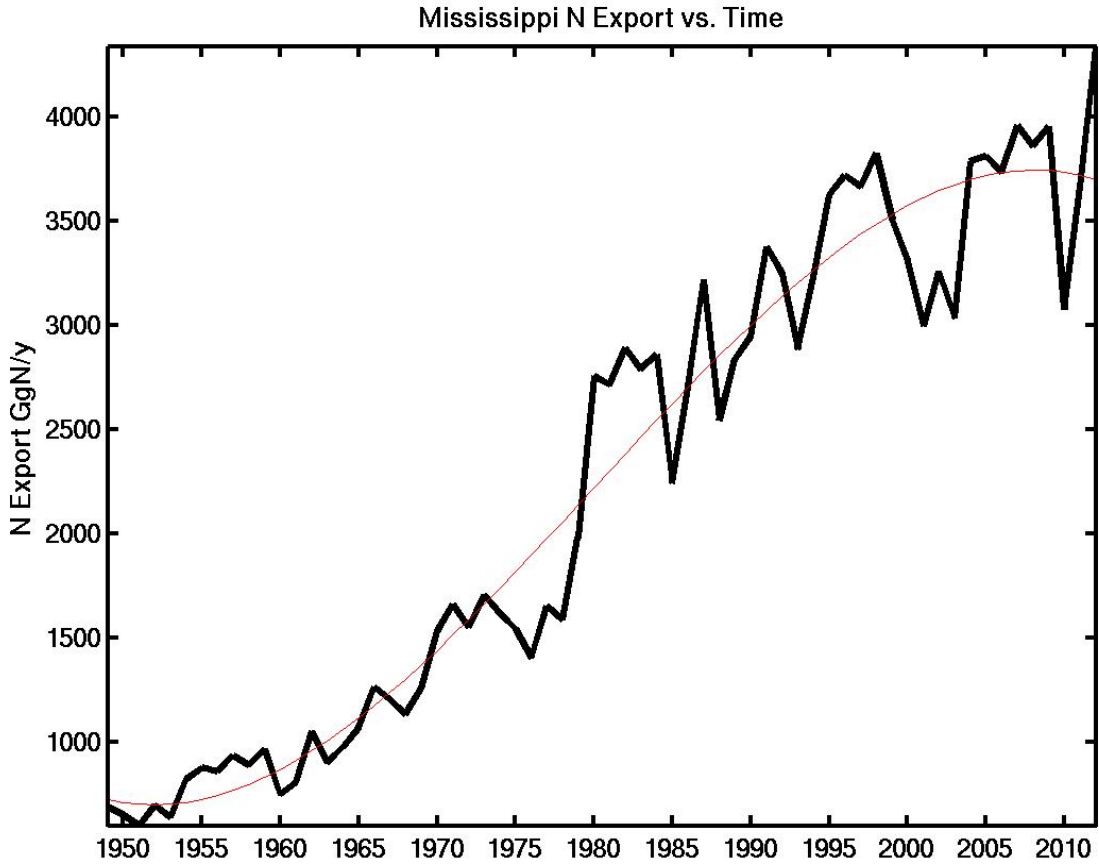
Leaching and Runoff



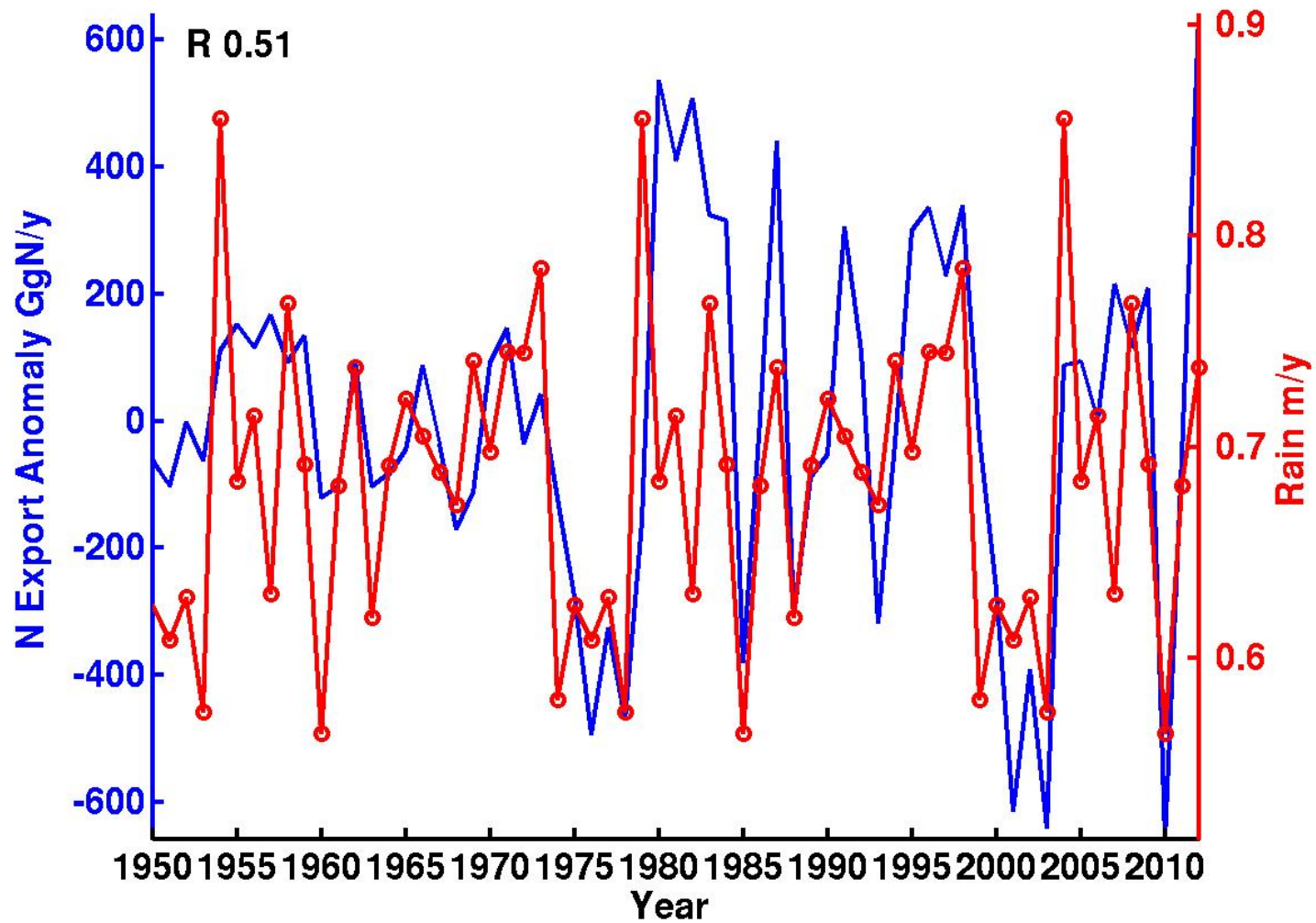
N₂O Produced by Sediment Denitrification



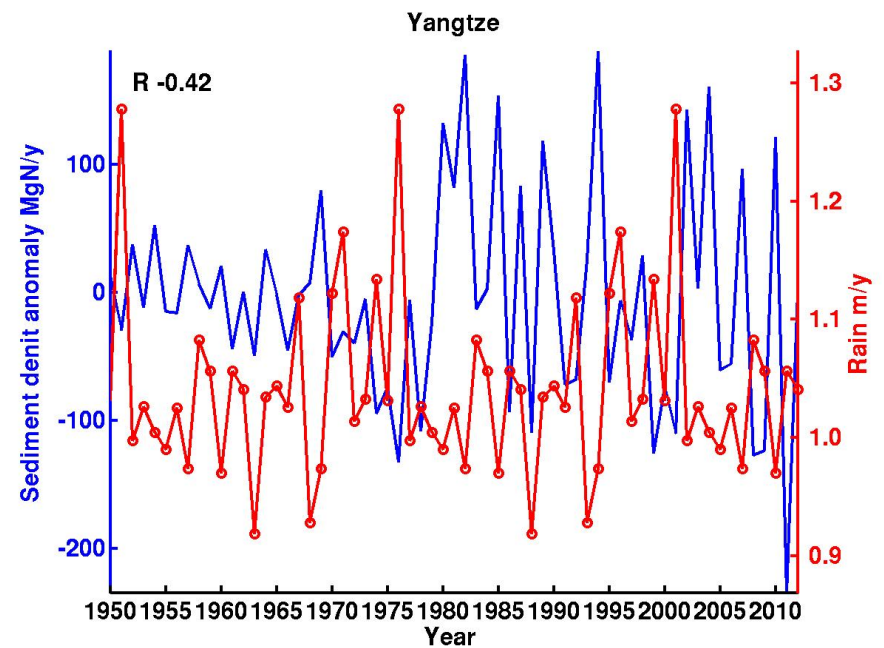
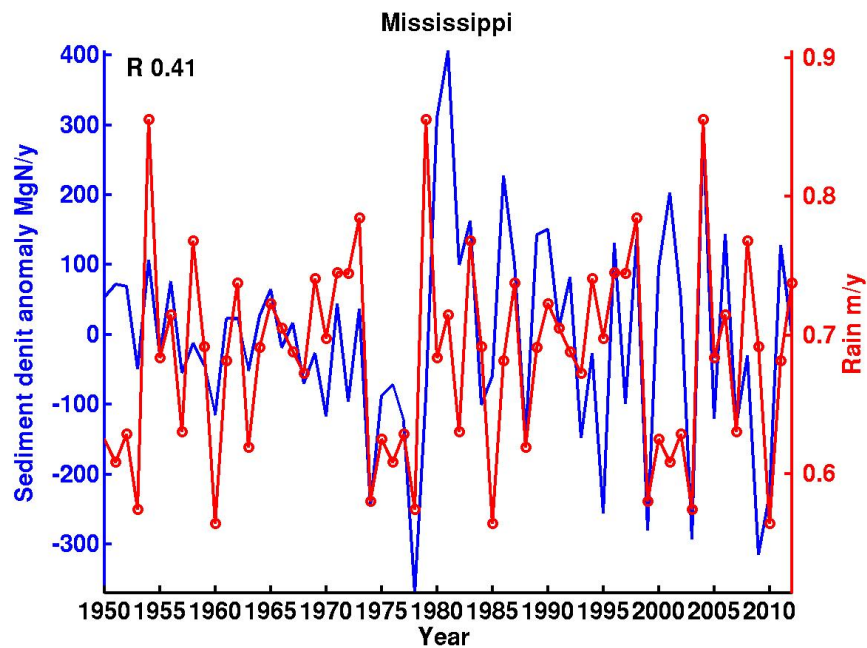
Trends in Mississippi River N export



Climatic variability in detrended Mississippi River N export



Climatic variability in detrended Sediment Denitrification (related to N₂O production)



Summary

- 1) CLM4.5: some remaining issues with magnitude and distribution of mineral N loss fluxes, but improved over CLM4.0.
- 2) N export to ocean increased by factor of 3 over last 60 years.
- 3) N export to ocean and river N₂O production sensitive to climate: wet years lead to increased leaching, but reduced sediment denitrification.

Global River N Export

